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ABSTRACT

This report identifies and discusses the management issues and resources associated with establishing a microcomputer support center within an organization. A general introduction supplies a definition of a microcomputer support center and a historical perspective on data processing services. The remainder of the document is divided into two major sections--Starting the Center and Operating the Center. Topics addressed include: (1) funding the center; (2) establishing center objectives; (3) need for a clear definition of center responsibilities; (4) options for placement of a center within the organization; (5) level of center staffing; (6) necessary staff skills; (7) sources for staff; (8) center facilities, including space, equipment, and software; (9) suggested center services; (10) hints for maintaining qualified staff, equipment, and software; (11) suggested areas to be covered in policy statements; and (12) evaluation methods for assessing the center operations and its staff. Concluding remarks on the role of the microcomputer support center in managing end user computing, a list of 41 references, and 21 sources for additional information complete the report. (JB)

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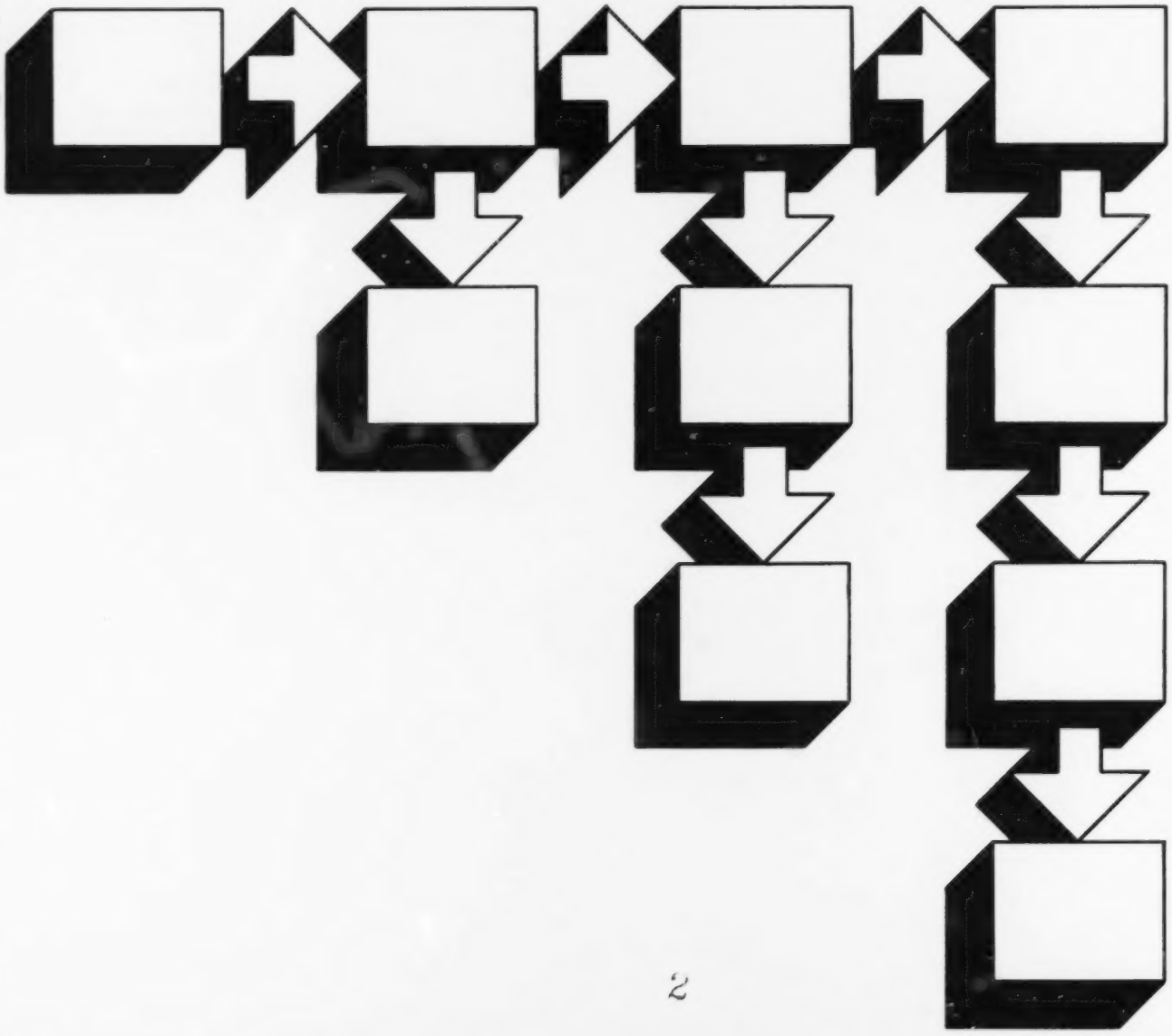
NBS Special Publication 500-128

Starting and Operating A Microcomputer Support Center

Ted Landberg and Stanley Winkler



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STARTING AND OPERATING A MICROCOMPUTER SUPPORT CENTER

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EXECUTIVE SUMMARY

This report identifies and discusses the management issues and resources associated with establishing a microcomputer support center. For managers contemplating the establishment of such a center, this report provides information on requirements for staffing, space, equipment, software and operating policies. The information presented is derived from reviews of operational experiences of existing installations in the Federal Government and private sector.

This report recommends an incentive based strategy for supporting end user computing. This strategy has been incorporated into the mission planning, assembling of requisite resources and operating a microcomputer support center.

This report provides a number of observations about microcomputer support centers. In summary the following observations are made:

Microcomputer support centers can vary in size and complexity from formal, autonomous units to informal ad hoc arrangements [Section 1.1].

The services offered by the center depend on the organization's level of computer literacy and historical use of advanced technologies. Centers established in organizations using advanced technologies will require more knowledgeable and sophisticated support staffs to be successful [Section 2.0].

Centers may be initially funded from a central source, but should implement a chargeback system for recovering costs from end user departments [Section 2.1.1].

Planning for centers should include explicitly stated objectives and clearly defined roles and responsibilities for managing microcomputer acquisitions, training programs, developing end user applications and specifying hardware and software standards [Section 2.1.3].

Policies must be established for computer equipment compatibility, end user developed applications, and microcomputer security and data integrity [Section 3.2.3].

The microcomputer support center should report to a senior level manager within the information resource management function [Section 2.2].

A mature center should have at least four staff members to achieve long-term success. Staff members should have people-oriented personalities with good coaching skills. The process of recruiting staff may require tapping unusual sources such as former end users, hobbyists or technically oriented trainers [Section 2.3.1].
Many centers are using knowledgeable end users to supplement staffs. Outside contractors are also available to help establish centers and provide training [Section 2.3.3].

Turn-over impacts continuity of services more adversely in centers with small staffs. Staffing practices must emphasize cross training and regular rotation of assignments [Section 3.2.1].

The center should be equipped with the latest generation of microcomputers and peripheral devices. Generally, from seven to ten units are needed for demonstration, training, and staff use. Good quality, sturdy furniture is cost effective and promotes increased use and productivity. The space should be attractively furnished to encourage end users to return [Section 2.4].

An extensive library of software for demonstration and evaluation purposes is recommended. Educational versions of popular software are very cost effective. Public domain software can be useful but requires considerable staff time to evaluate and maintain [Section 2.4.3].

Control of an organization's inventory of hardware and software is important to ensure application compatibility and operability [Section 3.2.].

Most centers provide demonstrations and training in microcomputer-based technologies. These services promote the effective and efficient introduction of new technology into the organization. End user assistance in developing new applications and solving problems is another important activity in the center. Newsletters are an excellent way to leverage staff resources [Section 3.1].

Successful centers all have established performance measurement systems. Most use a mix of statistics, narrative success stories and customer satisfaction surveys to justify continued existence Periodic self-appraisals of the center should examine performance against stated objectives and the effectiveness of services offered [Section 3.3].

STARTING AND OPERATING A MICROCOMPUTER SUPPORT CENTER

1. INTRODUCTION

Direct access to computing resources by end users is a major requirement in many organizations. This requirement is a result of the need to improve productivity in the office and the awareness that microcomputers can contribute to personal productivity by providing new tools to solve many problems effectively.

The use of computing power by non-data processing professionals is a new phenomenon. Some predict that by 1990 over half of the white collar work force will be using a computer terminal. Most professionals and their support staff will need an understanding of how to operate a microcomputer; and access to a microcomputer will be a necessity.

Throughout this report, two terms will be used: **end users** and **end user computing**.

> End user - one who requires access to computing resources in the pursuit of his activities.
>
> This term has been used to refer to those who use personal computers. The nature or location of the computing resource does not affect who is an end user. Wherever the computing resource exists -- desk top, departmental minicomputer or a central mainframe computer -- an end user is one who uses computing power directly, i.e., without a data processing professional acting as a surrogate between the user and the computer.
>
> End user computing - Use of computing resources by individuals to achieve a solution without the immediate intervention of data processing professionals.
>
> Sometimes the term personal computing is used interchangeably with end user computing. In a sense, personal computing does not necessarily imply the use of personal computers.

A major factor in the rapid growth of end user computing has been the emergence of software which takes advantage of special characteristics of microcomputers. The applications

developed on these microcomputers have become an integral part of the daily operations of many organizations and are vital to their success. A new strategy was needed to support these computing resources which due to their nature were dispersed within the organization. Traditionally, data processing allocated scarce computing resources by using economic justifications and mission sensitive priority schemes. Inexpensive microcomputer hardware and software have diminished the rationale for this approach. In its place is an end user computing support strategy based on incentives to adopt microcomputer hardware and software that are organizationally supported with acquisition, training, updates and problem resolution services. An emerging solution to managing end user computing has been a strategy which deploys this support in facilities apart from data processing mainframe centers and development staffs. The microcomputer support center is one example [LEHM85].

1.1 Definition of a Microcomputer Support Center

A microcomputer support center is a service organization assisting those using microcomputer based technologies. Some organizations use the title "information center" to identify this kind of end user support activity. Often these centers will provide mainframe based end user computing services as well. Most centers provide a core of services, including technology demonstrations, competency training, consulting and support, and limited access to computing resources. The services are not fixed and often change as the center matures.

A major strength of microcomputer support centers is their flexibility and their responsiveness to varying needs. The variance in size and complexity of microcomputer support centers ranges from formal, autonomous units to informal, ad-hoc arrangements. Established centers operate from fixed locations, equipped with training and maintenance facilities, with reference libraries and with a permanent staff. Ad-hoc centers are characterized by a loosely connected network of experienced professionals already in the organization, who can assist end users. They are also characterized by a small amount of hardware available for common use. Irrespective of structure, each center should select those services suited to its own end user community.

1.2 Background and Historical Perspectives

During the mid-1970s the processing of data had become an essential part of commercial and industrial activity rather than just a desirable aspect [VANE81]. The perceived need for data processing services was expanding rapidly. At the same time, complaints about the services provided by data

processing centers began to increase. There were often unreasonable delays between the request for an application and its delivery. Managers struggled to improve efficiency and service, yet customers and clients complained that data processing services were too slow, inadequate, unreliable and non-responsive.

In 1976, IBM Canada proposed a simple yet elegant solution, namely: assisting end users to do their own computing. The organization providing the assistance was called the information center. As a strategy, the information center concept was very successful and became very popular among data processing managers. Large productivity gains were reported. End users found that they could do their jobs in a timely fashion and management observed that costs were contained.

The information center concept was successful because it provided access to computing power for end users without straining the resources of the data processing function. The information center provided end users with an advocate and the data processing department with a spokesman. The scarce resource of programmers and analysts could be applied to the essential and difficult tasks. The simple and routine jobs were being handled by the end users, who, since they understood best what they wanted to accomplish, could actually perform the jobs better.

As more professionals who were not computer experts began to use the computer to solve their problems, the desire to do more personal computing grew. At the same time, the microcomputer, which had been considered a gadget or a toy, emerged as a tool for the professional. It was possible at reasonable cost to place significant computing power on the desk of every professional, however a new set of problems now appeared.

The end user found that the purchase of microcomputer hardware was the least of his problems and the smallest portion of the cost. There was a bewildering spectrum of choices: software systems, utilities, peripherals, furniture, training, on-line aids, etc., in seemingly endless variety. The end user again called for help.

Also, management realized that, while the cost of each personal computer was reasonably small, the aggregate initial investment and the cost of upgrading, maintaining, and supporting this new resource was not small. The microcomputer support center has been created to assist end users cope with this new computing environment.

2. STARTING THE CENTER

In many cases, establishing a microcomputer support center is prompted by one of the following conditions:

> A sizeable group of end users exists without adequate support for microcomputer acquisitions, training, installation and repair, and resolution of hardware and software problems.
>
> Existing technology support and training organizations are not equipped to handle new responsibilities for microcomputer technologies.
>
> Management wants to consolidate and coordinate "ad hoc" microcomputer support activities already in existence.

The services offered by a new microcomputer support center will largely depend on the acceptance and use of advanced electronic technologies and the level of computer literacy in the organization. For example, end users familiar with mainframe-based decision support software or timesharing services will demand fairly sophisticated consulting and training services from a microcomputer support center. Other organizations with little computer-related experience will need to concentrate center services on demonstrations and training.

In some instances, a support function is formed in an ad hoc fashion by knowledgeable end users as a collateral duty. As their existence and usefulness becomes visible to management, these groups may become the basis for a formal organizational entity.

The recommended approach to avoid confusion and overcome the difficulties surrounding the formation of a microcomputer support center is to start slowly and proceed in planned phases. It is always necessary to balance needs against available resources, but a systematic procedure will achieve fully operational status faster than offering all services and functions at once. Introduce new services and functions sequentially, establishing one solidly before adding another. Offer services only when there are adequate resources to support them successfully. A risk aversion strategy is suggested to assure a "good start" for a new microcomputer support center. A discussion of some of the more common services and activities is found in section 3.1.

2.1 Planning

Planning for a microcomputer support center should start by interviewing end users who would benefit most from the existence of the center. The role that the center will play in supporting end user computing is dependent on whether the right mix of resources can be assembled to address the problems end users are experiencing using microcomputer-based technologies.

The plan for a microcomputer support center should give due consideration to its impact on other segments of the organization, upon whose backing and cooperation it depends.

2.1.1 Funding the Center

Initially, the microcomputer support center may be funded from a central source. As the center matures, a chargeback system should be established to allocate the costs of support services provided to end user departments. A pre-authorization scheme is desirable to minimize the amount of paperwork needed to initiate service. Training should be directly charged to the end user's department. The center may provide training by using either in-house staff or contracting with an outside organization. Other services which are candidates for departmental chargebacks are: application system development (labor), equipment loaners (rental), and software (purchase price). These fees may be easier to establish because end users have traditionally been charged for those services by the data processing function. If only a few departments use the center, then allocating a fixed percentage of the center budget to each user department may be an acceptable way of funding.

2.1.2 Center Objectives

It is important to the long-term survival of a microcomputer support center that its mission and objectives be understood and agreed to by management. Centers which have started informally should appraise their objectives during the planning process.

Most centers have a core set of common objectives which include: support of end-user computing; increased staff productivity and use of shareable resources; and improved control of common activities involving microcomputers such as purchasing, training, and maintenance. Management's expectations for the center to achieve these goals should be documented and a measurement system established to record progress. Section 3.3 discusses this subject.

2.1.3 Responsibilities

During the planning, a clear definition of roles and responsibilities for supporting end user computing must be developed. Responsibility should be clearly assigned for managing microcomputer acquisitions, training programs, end user developed applications, and specification of standard hardware and software configurations. In addition, the level of support to be provided by the microcomputer support center must be specified.

Before the planning can be completed, there are three major issues to be addressed. They are: organizational placement of the microcomputer support center, staffing of the center, and required facilities.

2.2 Organizational Placement

There are three options for placement of the center within the organization. It can be placed within the data processing function as a part of its customer service activity; it can be a separate but equal group reporting to the same manager as the data processing function; or it can be independent and separate from the data processing function.

Option 1 - Within Data Processing

Placing the center within the data processing function has certain advantages. It is easier to staff a center within the data processing function. This function has a pool of skilled personnel with experience operating computer resources and the existence of career paths remove the objection some professionals have to working in a center.

In addition, the data processing function has a large amount of resources including main frame computers, high speed printers and a variety of peripheral equipment. This environment makes possible additional services by connecting the microcomputers to the mainframes.

Finally, the data processing function has established standard services for procurement, supply, facility management and maintenance.

The main disadvantage of placing the center within the data processing function is that this function traditionally has been more attuned toward controlling the use of computers, than it has been toward encouraging hands-on use of computing resources by non-computer professionals. Data processing managers, with their large computer orientation, are sometimes antagonistic towards the idea of microcomputers.

A second disadvantage is that the data processing professionals may be so mainframe oriented that they do not have a clear understanding of small system technology or how to exploit it.

Option 2 - Within the Information Resource Management Function

The information management function manages office systems, data processing, telecommunications, data communications, and personal computers [NBS125]. Placing the microcomputer support center outside the data processing function, but reporting to a higher level within the Information Resource Management function, enables the center to participate in policy formulation and can assist in coordinating support services such as procurement and supplies. Recruitment of staff from the data processing function would still be possible. Autonomy from data processing would allow the newly established center to pursue new activities and ways of supporting end users.

Option 3 - Independent of Information Resource Management Function

In some private sector organizations where an Information Resource Management function has not been established, management may elect to place the center in an independent function. End users often favor this arrangement because they believe they can more easily influence the kind and the quality of service they receive. Separating the support center from other computing activities means there is less likelihood that competing priorities of other data processing projects will divert center resources. Effectiveness may be more easily measured in an independent center, although measurements are difficult in any case. However, counterbalancing these advantages are the problems of staffing, funding and all else that goes along with setting up a new independent operation.

Ideally, the microcomputer support center should be placed within the information resource management function. However, it should be noted that microcomputer support centers are currently operating successfully in each of the three situations described above.

2.3 Staffing

The microcomputer support center is a service organization that requires a versatile, people-oriented staff who can react positively to unfamiliar individuals, empathize with the problems of others, and cheerfully share knowledge and experiences. Since the initial center staff will probably be small, the staff members will have to be skilled in training, marketing, and the assembling of hardware, and must also be knowledgeable about several of the most widely used microcomputer software program packages.

Early success in communicating the center's services and in establishing a reputation for handling end user requests is essential for the long term viability of the center. It is also essential to establish a good relationship with other groups within the organization that perform similiar functions. This is particularly true of the data processing function.

The key staffing questions to be answered are:

- How many people will be needed to handle the work load?
- What skills and what level of experience will be required?
- Where can the individuals who can support the end user population be found?

2.3.1 Level of Staffing

The number of staff members required to operate a center depends on the specific role assigned to it by management. Some broad guidelines allow for estimating the size of the staff needed. A study of several mature microcomputer support centers found a range of 1 staff member per 50 microcomputers to 1 for every 125 microcomputers. The variation appears to be related to the amount of training and problem solving support that end users require [GART85]. Computer literate end users require less support.

Many mature microcomputer support centers have at least four people. Experience indicates that this minimum staffing level is required to acheive the critical mass needed to insure operational stability. Each staff person in a minimally staffed center must be able to fill several roles, including those of a hardware and software specialist, and trainer.

Although some microcomputer support centers start with less than four individuals, these centers sometimes encounter one or more of the following problems: badly overworked staff, incomplete or inadequate service to end users, and workload pressures not allowing for staff training or development.

The Gartner Group Service studied information center workloads and found that routine support activities required sixty-one staff days per month (or the equivalent of three full time individuals) to support 100-200 personal computers. Some staff growth can be expected as the center matures and furnishes additional support. For organizations with more than one thousand microcomputers or with geographically dispersed populations of end users, decentralization of centers may be appropriate [GART85].

2.3.2 Staff Skills

Perhaps the most important characteristic desirable in a staff member of a microcomputer support center is a native intelligence, a natural ability to learn quickly, and a capacity to absorb new material and ideas. In other words, the microcomputer support center staff should have personality profiles appropriate to their people-oriented work.

The following summarizes the technical, interpersonal and business skills desirable in a microcomputer support center staff:

Technical

- Knowledge of hardware and software in use by end user organization. Experience with microcomputer operating systems, at least one major spreadsheet, word processing, data base software packages, and one of the common timesharing services.

  Knowledge of communication protocols and software, Only minimal knowledge of a microcomputer programming language (i.e., BASIC, Pascal)

- Requirement and system analysis skills. Ability to synthesize system requirements from verbal discussions with end users, to develop solutions using off-the-shelf microcomputer software packages, and to comprehend data structures and logic algorithms while interacting with end users.

- Problem solving skills. Problem solving ability, particularly for those assigned to answer "hot line" calls from end users.

Inter-personal

- Oral communication skills. Ability to teach and demonstrate ideas to others.

- Internal and External Contacts. Sensitivity to management styles, familiarity and affiliation with professional organizations and acquaintance with knowledgeable contacts who may help to provide answers to questions that may arise.

- Coaching Skills. The ability to help others, without actually doing the work for them, and to effectively impart knowledge in one-on-one problem solving situations.

General Business

- Organizational. Knowledge of organizational policies, procedures, product lines, and mission; and an understanding of ways the microcomputer support center can assist in improving productivity.

- Management and planning skills. A general knowledge of current management practices and the ability to plan small projects.

Small microcomputer support centers will need to select individuals with at least minimal competency in several facets of the operation. Managers will find that job segmentation is not always possible given the fluctuating workloads, staff turnover, and fractional workload of many jobs. For example, the manager may need to consult, teach courses and write a newsletter as well as supervise all activities of the center.

2.3.3 Sources for Staff

Recruiting individuals for microcomputer support centers may require tapping unusual sources and choosing staff members from less traditional business backgrounds. Many centers are staffed with former end users, microcomputer hobbyists, or technically oriented training professionals. Each organization will implement end user computing support differently, based on its own culture, availability of talent and the relationships among other technology support groups. In addition to the microcomputer support center staff, there are two other sources for extending the level of staffing: contractors and end users.

Using Contractors

If existing staff lack specific skills in new or specialized technologies or if there is a temporary large increase in the workload, the use of outside consultants may be cost-effective. Consultants may be used effectively to train center staff, customize software packages and provide end user training for large groups.

Outside contractors may provide a preferred alternative to in-house staff microcomputer training where the number of end users requiring training is large. A small external group may succeed where the same size internal group will fail. A rule of thumb is that one instructor can teach about ten days per month. The members of the center staff assigned to training duties have to be allowed time away from other duties for course development and revision, something difficult to achieve with a small staff.

Many attempts at in-house training fail because the staff assigned to training duties never reaches a critical mass, and because of interference from other duties assigned. The resultant overload of the staff severely degrades the quality of training furnished. The center staff may also lack the training orientation, the patience, and the specialized skills required to train others.

Another area where outside contractors can be used is in actually operating the microcomputer support center. Several companies now specialize in performing requirements studies, recruiting staffs, and specifying hardware, software, furniture and floor layouts for new centers. They may also continue to operate the center in much the same way the contractors have operated large mainframe installations for several years.

End Users

In every organization there are individuals who become experts on using a particular software package or a specific piece of hardware. Frequently, these individuals are willing to share that knowledge. One way a microcomputer support center can facilitate the dissemination of this in-house expertise is to sponsor internal user groups. A user group is an informal organization of individuals with a common interest in a particular subject area. They meet regularly, develop personal relationships, and share acquired knowledge, software techniques, and sources of information. By allowing them to use the center's facilities as a meeting place, a center manager can encourage their existence and benefit from their voluntary activities.

2.4 FACILITIES

The facility resources allocated to the center are a significant factor in the services that can be offered. Many centers will start in one room and expand as they develop a record of accomplishment. The facilities required are: space (classrooms, demonstration areas, and workshop areas), equipment (microcomputer systems, projection equipment and furniture), and software (system, application and training programs).

Experience has shown that finding suitable facilities, particularly work space, is one of the most difficult problems to solve in starting a center. Space restrictions very often influence the choice and quantity of equipment.

2.4.1 Space

Whatever space becomes available, access to a microcomputer support center should be from main hallways to avoid the need for clients to walk through other operational areas to use the center. The available space must be divided among the activities planned, making multiple use of each part of the center wherever possible. Planning should also include utilization of existing common areas within the organization.

In some centers, the reception area doubles as a reference room and a demonstration area. The reception desk is used as the access control point. If this area is large enough, four foot high partitions can be used to divide it. For demonstrations, the arrangement should make it easy for small groups to watch comfortably. Cubicles for prototyping, individual consulting and hands-on trial use by end users, are desirable.

A workshop area for assembly and repair of systems is essential. Also needed are places for the safe storage of equipment, spare parts, and supplies. Access to these areas must be controlled on a need-to-enter basis in order to avoid distraction of staff and, on occasion, the loss of "borrowed" items.

Training areas require large (about four hundred square feet) rooms with special lighting, good ventilation, a whiteboard, and a projection screen. Such rooms are useful for training and meetings, and little else. Most centers will not have their own training rooms, but will need to use existing class or conference rooms.

2.4.2 Equipment

In selecting equipment, avoid custom made items for which repairs and maintenance parts would be expensive or difficult to procure. Use reliable vendors and purchase commercially available products which can be readily upgraded. Good sources of information about products and vendors are local user groups, trade publications and other centers. The best source is frequently the personal experience of individuals within the organization.

It is important to select a computer configuration which the center intends to support. This advice may seem obvious, but there have been instances where, in an attempt to keep initial costs down, centers have started with surplus equipment or with minimal system configurations that the center would not normally recommend for end users. This tactic reduces the staff to giving advice based on second hand knowledge instead of direct experience, and lowers the credibility of the center. A useful methodology for identifying requirements, evaluating alternatives and sources for equipment and software can be found in a NBS Special Publication "Selection of Microcomputer Systems", NBS 500-112 [NBS112].

A specific list of equipment for a center to start with would become obsolete very quickly. Generally, a center should have one microcomputer system for each staff member. This system should be the latest model fully configured with periherals commonly available in end user organizations. Center microcomputers preferably should be compatible with each other and comply with in-house equipment standards.

In addition to the system for the staff, the center should have two or three similar systems for demonstrations and hands-on examination by end users. The center should have other advanced systems, not necessarily compatible with its "standard" system, so that its experience, and thinking, are not limited to a single product line. Thus, it is suggested that a microcomputer support center begin operations with seven to ten systems.

The center might have a high speed letter quality printer or a laser printer if there are available funds. This would provide professionals access to high quality printing when required. A good graphics generation capability for charts and presentations is very useful. Besides demonstrations and training, this kind of equipment represents a resource which can be used thoughout the organization. It is customary to plan a three year life span for computer systems, including related peripherals, to keep center equipment at or near the

state of the art. This policy keeps the staff up to date and assures that the center can demonstrate the use of current rather than outdated systems.

Selection of other peripheral and accessory equipment would depend largely on what is and is not already available within the organization. Among the items to consider are overhead projectors, large screen televisions, projection display units, digitizers, digital pads and tablets, back-up tape decks, switch boxes, surge protectors, and emergency power.

Good quality, sturdy computer tables and printer stands are cost effective because they protect expensive equipment. Comfortable chairs encourage productivity. Metal paper bins or baskets instead of the customary cardboard paper boxes to feed printers are recommended because they reduce a possible fire hazard. Assembly, inspection and repair workshops need bench space, cabinets for spare parts, hand tools, cable kits, volt-ohm meters, and an oscilloscope. Expensive diagnostic equipment is not required; nor is the building of non-standard custom hardware.

2.4.3 Software

The microcomputer support center should acquire a large collection of software. Copies of various operating systems and utility programs should be available. Particularly useful is a good sampling of the various word processing, spreadsheet, and data base programs, as well as communication programs. Copies of special purpose software such as slide generators or statistical analyzers should be available within the center. End users should be encouraged to use this special software for projects before procuring their own copies.

Standardization should be encouraged by restricting support and training to those few software packages the center is advocating as the "official" software for the organization. The best way to choose software is through personal tryout. A center cannot control what packages end users will buy, but it can help them make informed decisions.

For training purposes, educational versions of most major software packages are available from the vendors at less cost than regular copies. These educational versions have copy protection which eliminate the risk of software piracy.

The center staff should be alert to sources of inexpensive software in the public domain. These programs are easily obtained from the local user groups or from those user groups that have gone "national". Appendix A has a list of professional associations which are excellent sources of informa-

tion. The quality of this software is variable, but generally the public domain contains some excellent programs. This software is widely publicized and end users will inquire about it. The center should be able to discuss and demonstrate it. Because acquiring, evaluating and maintaining a library of public domain software is time consuming, new centers may want to defer this service or encourage one of their end users to maintain the library for them.

3.0 OPERATING THE CENTER

Some of the important activities and operating procedures to be established once the center begins daily operation include: support services to be offered, staff rotation, equipment maintenance procedures and policies promoting the effective use of microcomputers. Publicity such as announcements, newsletters, and an open house, are commonly used to signal the start of operations. Another way to generate interest in the opening of the center is to schedule several demonstrations. The demonstrations are most effective if planned so that there is at least one for beginners, one for experienced users and one for experts. Additionally, marketing the center to end user organizations and a measurement program to document the center's activities for annual performance and budget reviews are necessary activities. This section will provide some insights into these topics.

3.1 Center Services

In addition to responding to end users' immediate calls for assistance on equipment and software problems, the center's services should be designed to help the organization in its overall use of microcomputer technologies. This section discusses four categories of services which the center may provide: the introduction, application, support, and selection of technology.

3.1.1 Introduction of Micro-based Technology

The introduction of micro-based technology is accomplished mainly through demonstrations, prototyping, small group sessions, newsletters and direct contacts with end users.

Vendors are usually very interested in providing demonstrations or in lending hardware or software to the center. Many vendors offer free or inexpensive sample diskettes which illustrate how their software operates. Prototyping, the development of a small, limited version of a specific system, utilizes interactive software and provides end users with an actual example of the use of a new technology.

Newsletters which provide training schedules, new hardware and software announcements, and solutions to common problems are a very effective way to leverage limited staff resources. Newsletters are also an excellent way to market the center to non-users. Often personal contact by the center staff with non-users provides a forum for suggesting ways in which microcomputer technologies can be productively used in the organization.

3.1.2 Application of Micro-based Technology

This set of services includes training and information exchange activities that increase end user understanding of the capabilities of the technology.

Training is considered the most important activity of most microcomputer support centers. Competency in microcomputer based technologies can be developed by lecture, video cassette courses, computer based training modules, or courses where students learn by using the computer in "hands on" training sessions. The competency acquired in using microcomputer application software enables end users to return to their departments and apply this knowledge to develop new ways of performing their daily activities.

Continuing education of end users is essential in order to maintain their skills. This is best accomplished by small workshops, roundtable exchange of solutions and techniques, internal user groups, electronic bulletin boards, libraries, and newsletters.

As the center matures, a clearinghouse function can be started. Regular contact with other centers and local user groups involved with microcomputers are excellent sources for training courses, software evaluations, and recommendations for staffing. A clearinghouse should have vendor catalogs, user group magazines, and public domain software. Listings from national bulletin board systems describing software "bugs" and miscellaneous macro programs are of particular interest.

3.1.3 Support of Micro-based Technology

Walk-in support, access to mainframe resident computer data bases, and assistance in locating external experts all are ways to aid end users needing help with problems. Support of technology services includes assistance with installation, upgrading and repair of hardware and software.

This activity may involve coordinating hardware and software exchanges to maintain up to date versions of microcomputers systems. Some centers maintain records of what software has been purchased, update software and assist end users retire old equipment and software when no longer needed.

Equipment and software used by the microcomputer support center for training and demonstration represent a computing resource that can be made available to end users when not being used in training. In addition, the center may have special equipment such as plotters, slide makers, optical

character readers, and special telecommunication lines to central mainframe computers and commercial data bases. End users may start using the center's equipment prior to or in lieu of procuring their own.

The center is the place where users can familiarize themselves with and begin use of the technology prior to delivery of their own systems. Good scheduling and setting limits are important to protect the microcomputer support center from becoming captive to a few aggressive departments.

Microcomputer support centers can become gateways to external computing services. Since a center has trained staff, facilities and operating procedures to handle telecommunication links, these services can be introduced and experimented with in a controlled environment before becoming available for widespread internal use. The center is a logical place to install such office system applications as electronic mail, calendaring and correspondence management.

3.1.4 Selection of Technology

Microcomputer support centers are often expected to offer advice and guidance to those wishing to purchase microcomputers and related items. For this purpose they should maintain vendor catalogs, price lists and delivery schedules. Centers that are also responsible for preparing purchase requisitions must track purchase orders and follow up on misplaced or defective merchandise.

An option chosen by some is to establish a computer store from which end users can obtain equipment, software, and supplies as off-the-shelf items based on prior budget approval. An advantage of a computer store is that it permits an organization to arrange for employees to purchase personal computing needs at a discount, serving the dual purpose of encouraging personal computing and raising morale.

3.2 Operational Management

This section discusses some issues pertinent to day-to-day operational management. These include maintaining qualified staffs, equipments, software, and policies relating end user computing.

Additionally, microcomputer support centers must be dynamic. The staff must keep abreast of a rapidly changing technology and to be ever aware of end user needs. Stagnation for a microcomputer support center means the end of its usefulness.

3.2.1 Maintaining Qualified Staff

Staffing practices need to anticipate staff turnover. Continuity of operation can be preserved by cross training staff members and rotating staff through various assignments.

In addition to the permanent staff, employees from other support areas such as data processing, office automation, training and end user departments, can be assigned to the center for a fixed period of time as a step in their career paths.

The center manager should plan periodic rotation of the staff into other areas within the organization. Although a temporary loss, rotations expand skills of staff members and improve their long term career opportunities. Candidates will view employement in the center as an opportunity for advancement in the organization, making recruitment of good people easier.

3.2.2 Maintaining Equipment and Software

An important task for the manager of the center is to find funding for new hardware and software. Some centers arrange to give last year's hardware to new end users who have such a requirement. New hardware is then funded by budget transfers.

Commercial microcomputer software often is revised every twelve to eighteen months. In addition to the new products that appear on the market, there are the regular updated versions of existing software and hardware. Training courses must then be updated or a workshop held to bring end users up-to-date with the new products.

Microcomputer based technologies are tending toward full function word processing packages capable of document transfer and interchange between hardware of different manufacturers. Experienced end users are requesting access to a central computing resource environment for communication linkages, data base management systems, fourth generation languages, and the predominant hardware vendor. Compatibility and connectivity with these central computers will be essential in the future.

The maintenance of equipment of course implies repairs. Generally, repairs consist of unit or board replacements. The microcomputer support center will need to make arrangements with outside vendors to actually repair or replace defective units.

The portable nature of microcomputers and software makes the tracking of their location difficult. One way to regularly inventory software and hardware is to require the holders to re-register these products before receiving updates.

3.2.3 Policy

Even if the center is not responsible for establishing policies for microcomputer usage, the services it provides and the technology it supports represent defacto policy.

Whether responsiblity for issuing standards and procedures on microcomputer based technologies resides in the data processing function or elsewhere in the organization, the following areas should be covered by formal policy statements:

> Computer equipment connectivity - Explicit requirement statements are needed for interconnection of microcomputers with departmental and central mainframe computers. Policy statements on connectivity often are the basis for qualifying microcomputer vendors that will meet these requirements and establishing an approved "buy" list of microcomputer products.
>
> Application portfolio management - Documentation requirements for end user developed applications should be established. These would include spreadsheets, data base and data file systems, and other applications developed by end users. Procedures for management review and periodic audits by a "quality control" staff should be included. Portability and potential use by others are possibilities that should be considered.
>
> Security and data integrity - End user responsibilities for physical security of equipment, software, and data files need to be negotiated and approved. Requirements for regular archiving of data files, and organizational procedures to preclude software piracy must be included. Additional information can be found on security issues related to microcomputers in "Security of Personal Computer Systems: A Management Guide," [NBS120].

There are many other policy issues involving microcomputers that should be addressed by those responsible for managing end user computing. A more comprehensive discussion of these issues can be found in "Issues in the Management of Microcomputer Systems",[NBS125]

3.3 Measurement

A microcomputer support center, can best be evaluated in terms of satisfaction of the needs of its clientele. "Satisfaction" is difficult to quantify. Where there are competing providers, market forces furnish an effective measure of satisfaction. In a non-competitive situation, however, one must be careful not to assume that absence of complaints implies satisfaction or to rationalize complaints as uninformed opinion. An alert manager of a center will be aware of and responsive to end user dissatisfaction [LEIT85].

End user satisfaction provides on important indication that the center is achieving its objectives and can be used by the manager to justify center budgets, purchase requests and staff increases. Supporting evidence is obtained by self assessment, keeping logs and compiling statistics, and by polling end users.

3.3.1 Self Assessment

Periodic, critical self-appraisals of the center by its staff and its manager, if objective, can be valuable. The first aspect of an evaluation is to examine the performance of the center against the stated objectives. If the staff has realistic evidence that it is meeting the objectives of supporting end user computing in a satisfactory manner, then the center is probably performing a valuable service. On the other hand, if not, then remedial actions should be explored.

The second aspect of assessment is a review of the objectives themselves. Replacing outdated objectives and adding new ones is an essential part of keeping current and continuing to satisfy end user needs.

The third aspect of assessment is an evaluation by the manager and his/her staff of: the adequacy of the staffing level, the continued suitability of the hardware and software available within the center, the technical and social skills of the support staff, the adequacy of the facilities in relation to their use by staff and end users, and the workload of the center.

3.3.2 Quantitative Measures

Statistics are an effective way to describe the extent of the activities of a center. For a microcomptuer support center, numbers are obtained by collecting statistics on the users and usage of the center. The difficulty lies in deciding what numbers to collect and in avoiding meaningless or misleading statistics.

Each center will, of course, develop its own list, but among the useful data that can be compiled are the number of: end users who utilize the center, "hot line" calls that are answered, individuals who are trained, training courses and students enrolled, demonstrations given, non-users converted to end users, software packages provided by the center, end users whose equipment has been improved or updated on advice of the center, visitors to the center, staff hours applied directly to end user support, requests for subscriptions to the center newsletter, requests for specialized services, and "house calls" made by the staff [MICH85].

In general, these data points will be gathered manually from logs the center should keep of visits and telephone calls. It has been suggested that an interactive "log" at the entrance to the center be used to gather information about visitors, such as who they are and the purpose of these visits. So far there has been no report of extensive use of the "log". Another suggestion has been the use of an electronic bulletin board to collect information, but its reliability and completeness are questionable.

3.3.3 Qualitative Measures

Since the "collectible numbers" give an incomplete picture, it is necessary to use polls and questionnaires. Polling can include the entire end user population or a sample. Questionnaires are hard to create. Not only must the questions be selected carefully and presented in an orderly and logical sequence, but also the wording of each question must be clear and unambiguous. The best way to use questionnaires is to repeat them periodically so that the answers at different times can be compared.

The specific questions used will vary from center to center, but the general areas that the questions should explore are:

- Who are the end users?
- Are the end users satisfied, in general, with the services provided?
- What services can be removed?
- What services should be added?
- Are the delays in receiving services experienced by end users acceptable?
- Are the facilities of the center adequate?

The questionnaire should solicit negative and positive feedback. Although hard to evaluate its significance, the number of end users who take the trouble to reply to a questionnaire is an important indicator of end user interest in the center.

3.3.4 Evaluating the Data

Without some evidence to "justify existence", the management of the parent organization may not be aware of the quality and level of effort provided. As one experienced center head expressed it, "If you don't count your users, it is the same as if you didn't provide the service."

Every manager would like to relate specific actions and decisions to end user productivity improvements. A recent study for the Office of the Assistant Secretary of Defense concluded that some productivity improvements generally could not be either measured directly or quantified [NBSIR85]. However, there were a number of subjective observations such as attitude, morale, quality of decisions, improved control of process and product, increased flexibility, better communications, which many managers were willing to accept as criteria for the success of a center. These managers, although acknowledging the subjective nature of the observations, were willing to make informed judgements using their experience and intuition as a guide.

4. CONCLUDING REMARKS

The rapid proliferation of microcomputers in organizations makes it likely that end user computing will dominate the work place during the next decade The microcomputer support center is a strategy that organizations are using to manage end user computing. It is a focal point for controlling microcomputer based technologies by providing support and training to those seeking to use that technology to improve their individual productivity.

Beyond the current wave of microcomputers lie several emerging technologies such as computerized private telephone systems, voice and image processing and office systems that will require the same kinds of end user support activities that microcomputers have received. The microcomputer support center is developing the techniques and experience to manage these new technologies. It or some successor will continue to play a leading role in supporting end users of new technology, but successful continuation of a center requires both commitment and attention from the management of the parent organization. The activities of a center should not be understated; they are very labor intensive. Nurturing, hand holding, and responding to queries require considerable time, effort, and resources. However, the benefit from this type of assistance has proven worth the effort.

This report has made a number of observations and has provided specific guidance related to microcomputer support centers based on reviews of operational experiences of existing installations in the Federal Government and private sector. This report has stressed that irrespective of the scope of a microcomputer support center, it is imperative that careful planning and requirements analysis of the organization to be supported be conducted. The success of a microcomputer support center is predicated on such planning and the continued review of its operation.

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Appendix A

SOURCES FOR ADDITIONAL INFORMATION

Magazines which regularly discuss Information Center topics:

INFORMATION CENTER
Weingarten Publications, Inc.
38 Chauncey Street
Boston, MA 02111

JOURNAL OF INFORMATION SYSTEMS MANAGEMENT
Auerbach Publishers, Inc.
6560 North Park Drive
Pennsauken, NJ 08109

PC WEEK
Ziff-Davis Publishing Co.
One Park Avenue
New York, NY 10016

Professional Associations and User Groups devoted to Information Centers

Information Centers SIG
Association of Federal Computer Users
c/o Maureen Naley
Graduate School, USDA
600 Maryland Avenue, N.W.
Room 106
Washington, DC 20024

Baltimore/Washington Information Center Association
c/o Anna Doroshaw
6411 Ivy Lane, #612
Greenbelt, MD 20770

California ICMA (Information Center Management Association)
c/o Marilynn Stricklett
Pacific Mutual Life
P. O. Box 9000
Newport Beach, CA 92658

Information Center Exchange of Chicago
c/o Mike Vuick
GTE Communications
400 N. Wolf Road
North Lake, IL 60164

New York MVMUA (Metropolitan VM Users Association)
c/o Simcha Druck
Teachers Insurance Annuity Association
730 Third Avenue
New York, NY 10017

Federal Agencies with established Information Centers

U. S. Dept. of Agriculture
Information Technology Center
600 Maryland Avenue
Washington, DC 20024

U. S. Dept. of Army
Microcomputer Technology Center
5611 Columbia Pike
Falls Church, VA 22041

U. S. General Services Administration
Microcomputer User Support Group (KGSE)
Room 1209
18th & F Streets, N. W.
Washington, DC 20405

U. S. Geological Survey
810 National Center
12201 Sunrise Valley Drive
Room BCID
Reston, Va 22092

U. S. Dept of Health & Human Services
Federal Drug Administration
Microcomputer Center
5600 Fishers Lane
Rockville, MD 20857

U. S. House of Representatives
House Information Systems
Demo Center Annex 1, Room 117
Washington, DC 20515

U. S. Department of Interior
Information Technology Center
18th & C Streets, NW
Room 4028
Washington, DC 20240

U. S. Department of Labor
Directorate of Technology
200 Constitution Avenue, NW
Washington, DC 20210

U. S. National Technical Information Service
Information Center
5285 Port Royal Road
Room 2018
Springfield, VA 22161

U. S. Department of Navy
Technical Support Department
Navy Microcomputer Research Group
NARDAC-Norfolk
Building V53
Naval Air Station
Norfolk, VA 23511

U. S. Securities & Exchange Commission
User Support Information Center
450 5th Street, NW
Room 2034
Washington, DC 20549

U. S. Veterans Administration
Information Technology Center (32 A ODM&T)
810 Vermont Avenue
Room 237
Washington, DC 20420

Local Microcomputer User Groups

Local microcomputer users groups offer an excellent source of support on software and problem resolution. A complete listing of such groups can be found on the Institute for Computer Sciences and Technology electronic bulletin board:

Microcomputer Electronic Information Exchange

(301) 948-5717 or 948-5718

NBS-114A (REV. 2-8C)

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☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

This report identifies and discusses the management issues and resources needed to establish a microcomputer support center. For managers contemplating the establishment of such a center, this report provides information on requirements for staffing, space, equipment, software and operating policies. The information presented is derived from reviews and operational experiences of existing installations in the Federal Government and private sector.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

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National Standard Reference Data Series—Provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated. Developed under a worldwide program coordinated by NBS under the authority of the National Standard Data Act (Public Law 90-396). NOTE: The Journal of Physical and Chemical Reference Data (JPCRD) is published quarterly for NBS by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements are available from ACS, 1155 Sixteenth St., NW, Washington, DC 20056.

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